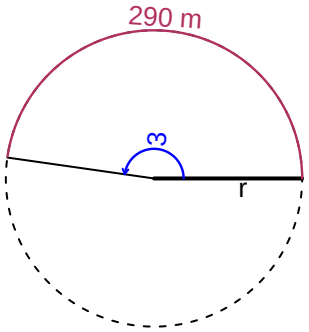
Name: Date:

Trig Final (SLTN v603)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 290 meters. The angle measure is 3 radians. How long is the radius in meters?

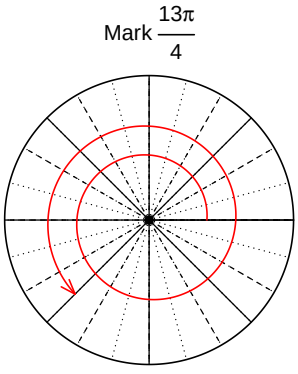


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

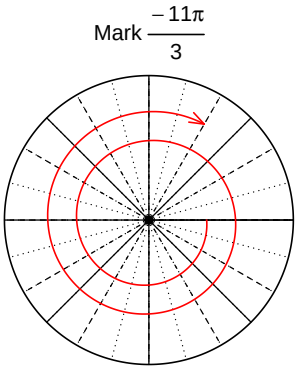
$r = 96.67$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{4}\right)$ and $\sin\left(\frac{-11\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(13\pi/4)$



Find $\sin(-11\pi/3)$

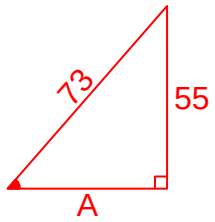
$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{-55}{73}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

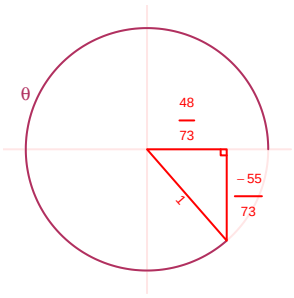
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 55^2 = 73^2$$
$$A = \sqrt{73^2 - 55^2}$$
$$A = 48$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-55}{73}}{\frac{48}{73}} = \frac{-55}{48}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.23$ meters, a frequency of 8.58 Hz, and an amplitude of 4.1 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.1\sin(2\pi 8.58t) - 5.23$$

or

$$y = 4.1\sin(17.16\pi t) - 5.23$$

or

$$y = 4.1\sin(53.91t) - 5.23$$